In the invertase activity experiments, holding a high-sucrose nectar from young flowers for 19 h had no significant effect on its sugar composition [$F(1,14) = 3.90$]. Furthermore, placing nectar samples in volumes of pure sucrose solution had no detectable effect on the mixture. Thus, there is no evidence for the presence of invertase in the nectar. Apparently, nectar must change as the flower ages. The failure of the nectar in the eight flowers to show a significant difference from the 10-flower sample (sampled at mid-day) suggests that it is constantly secreted and reabsorbed by the nectaries, rather than nectar of one composition secreted as others are removed from the flower.

The radioactive sucrose experiments showed that an average of 20.6% of the sucrose was reabsorbed by the flower during the 8 h period. This corresponds to the 20.8% decline in sucrose observed during the same period in Table 1. Furthermore, 85.2% of the radioactivity after 8 h was still in the sucrose form, with 7.8% and 7.0% present as labeled fructose and glucose, respectively. It seems that these changes are of sufficient magnitude to explain the decrease in nectar sucrose during the first day. Reabsorption of radioactive sucrose has been confirmed previously by Pederson, LeFevre, and Wiebe (Science 127:758–759, 1958) who also demonstrated that carbon-14 was translocated to other parts of the plant, particularly actively growing areas. Labeled sucrose was undetectable in the nectars of other flowers because of the low levels of radioactivity used.

Discussion. The sort of nectar changes documented herein are similar in magnitude to those recorded in Loper et al. (op. cit.) and reconfirm Baker and Baker's (op. cit.) emphasis on sampling of freshly produced nectar. Also, this study shows that single nectar samples can be misleading as to the composition of a species. Variability could arise by intrinsic physiological processes or could be related to visitation by pollinators. Possibilities in the second category include regurgitation of invertase from the digestive system of the pollinator during feeding and/or micro-organismal contamination of the nectar by the pollinator (P. G. Kevan pers. comm.). In the case of *R. peninsularis,* intrinsic physiological factors clearly are implicated. If the nectar changes described herein have a selective basis, their significance in terms of pollination success is presently obscure. Perhaps, it is a mechanism by which plants can attract a wider range of pollinators. Different groups of visiting insects would find at least some flowers with acceptable nectars. These different groups of visitors, therefore, might continue to visit flowers seeking suitable nectars and transfer pollen. The increased number of potential pollinators could help assure successful seed set in that species. Caution must be used in interpreting these data, however, because only one plant under greenhouse conditions was studied.—C. EDWARD FREEMAN, Dept. of Biological Sciences, University of Texas at El Paso, El Paso 79968-0519. (Received 28 Jan 1985; revision accepted 20 Jun 1986.)

OBSERVATIONS ON THE POLLINATION OF *Dedeckera eurekensis* (POLYGONACEAE).—The California flora has a relatively large number of phyletically isolated monotypic genera with highly restricted geographic distributions. *Dedeckera eurekensis* is a recently discovered genus of this nature (Reveal and Howell, Brittonia 28:245–251, 1976). This shrub is known only from a number of disjunct localities in the Inyo, Last Chance, Panamint, and White Mountains at the northwestern fringes of the Mojave Desert (Morefield, Madroño 32:122–123, 1985). Populations range in size from only two plants to those with scores of individuals.

The reproductive biology of species with narrowly restricted distributions is of interest because of the high risk of extinction. *Dedeckera* is of further interest because

FIGS. 1, 2. *Dedeckera eurekensis.* 1. Habitat: Coldwater Canyon, White Mts., Mono Co., California. 2. Inflorescence: arrow denotes individual cluster of four flowers (open flower at end of arrow, two unopened buds above and below open flower, closed flower following anthesis at far right).

it flowers during midsummer when the majority of desert shrubs are dormant and annuals generally have completed their life cycles. The following preliminary observations are offered with the hope that they will stimulate more detailed studies of the reproductive biology of *D. eurekensis* and other narrow endemics.

We studied (5–6 July 1985) the floral biology of the population located ca. 1 km up Coldwater Canyon in the White Mountains, northeast of Bishop, California. The population is the largest known and the only one to border a riparian community. It is composed of scattered plants on a steep north-facing talus slope (Fig. 1). The species was not observed on the adjoining south-facing slope.

The plants grew to 1 m, are rounded in form and usually broader than tall. They produce thousands of small flowers (ca. 1–2 mm across) that literally cover the entire surface of the plant (Fig. 2). The small flowers might suggest autogamy, but this is rare (possibly unknown) among long-lived woody perennials [Wiens, Oecologia (Berlin) 64:47–53, 1984]. Examination of the floral morphology indicated that the flowers are protandrous, and therefore not autogamous.

During the male phase, the styles are strongly reflexed against the ovary. Following pollen dispersal, the styles become erect and receptive. The temporal sequences and compatibility relationships are unknown. During the female phase, the minute stigmatic tips become sticky. The flowers are odoriferous and the scent is reminiscent of honey. The sepals are pubescent both adaxially and abaxially. During anthesis, swollen areas (nectaries?) at the base of the sepals where the filaments arise appear to secrete a moist film, but no nectar-pooling was observed. Perhaps this secretory film also is the source of the odor. Following the female phase the sepals closely invest the pistil. Possibly this is a mechanism to protect seed development during the heat of midsummer (temperatures will usually exceed 38°C). The pubescence inside the flowers might serve a similar function by preventing desiccation of the basal secretory film of the flower during anthesis.

Twenty-eight insects were captured during a morning and afternoon of observation. Sixteen were Diptera, mostly several species of Sarcophagidae. The remainder were three species of wasps, a species of damsel fly (Zygoptera), a species of ambush bug (Phymatidae), and a lace wing (Chrysopidae). Syrphid flies were observed, but none was captured. The sarcophagid flies generally carried *Dedeckera* pollen about the proboscis and sternum, but in small quantities. *Dedeckera* pollen also was observed on one wasp in moderate quantities on the sternum. Because Polygonaceae have a single ovule per flower, large pollen loads are perhaps less important. Pollen was examined from insects by methods found in Beattie (Pan-Pacific Entomology 47:82, 1971).

The insect species captured on *D. eurekensis* do not represent all the species that visit the flowers, because many more insects were observed on the flowers than could be caught. Little insect activity was noted between ca. 0500 h and full sunlight at ca. 0700 h. The earliest visitors were the sarcophagids, whose activity increased markedly about this time, followed by the various other visitors. Insect activity was prevalent throughout the day, but dropped off appreciably around 1600 h when it became windy. After 1800 h there was little insect activity until dark at ca. 2150 h. A larger number of insects appeared to visit plants near (within ca. 10 m) the stream than visited plants farther up the steep scree slope.

These observations suggest that sarcophagid and perhaps other short-tongued scavenger flies are probably the most numerous insect visitors that could effect pollination, followed by species of wasps, and possibly syrphid flies. These insects are attracted presumably by the odor and probe for moisture at the base of the flowers. The floral tube approximates the length of the proboscises (ca. 2–3 mm) of most visitors. The other insects mentioned are predators of other insects, and ineffective pollinators.

The only other plant flowering in the vicinity was *Petalonyx nitidus* Wats., which has a long, narrow tube. It was visited and presumably pollinated by a long-tongued fly (Bombyliidae?), which was not collected. This species was not observed visiting *Dedeckera.*

These strictly preliminary observations suggest that *D. eurekensis* is most likely pollinated by short-tongued sarcophagid flies and perhaps secondarily by wasps and syrphid flies. Few species pollinated by generalist flies have been studied thoroughly, and more information on this type of pollination system would be useful. It also would be interesting to investigate reproductive success in more depauperate *Dedeckera* populations such as that at ca. 1100 m in the Last Chance Mountains east of the Eureka Dunes, which consists of only two plants.—DELBERT WIENS, Dept. of Biology, University of Utah, Salt Lake City 84112; MARY DEDECKER, Box 506, Independence, CA 93526; and CAROL DEDECKER WIENS, 1763 Ann Dell Lane, Salt Lake City, UT 84121. (Received 21 Nov 1985; revision accepted 17 Jul 1986.)

SOME RESPONSES OF *Sidalcea calycosa* (MALVACEAE) TO FIRE.—Fire in California's introduced annual grassland is commonplace, but its effects usually are limited in extent and duration (Heady, *In* M. G. Barbour and J. Major, eds., Terrestrial vegetation of California, Wiley Interscience, 1977). Fires from the grassland frequently burn into the adjacent, predominately native vegetation of vernal pools where the role of fire has not been examined. To begin evaluation of the effects of fire on vernal pool plants, density and fruit production were studied in burned and unburned portions of a population of *Sidalcea calycosa* Jones. The autecology of this annual California endemic, which is common to some vernal pool margins and similar areas, has not been investigated previously.

Study site. The study site is at an elevation of 75 m and 1 km east of Chico, Butte Co., California. The topography is mostly flat with several channel-like depressions about 5 m wide and 0.25 m deep that are separated by broad mounds less than 1 m in height. These depressions are without natural outlets and maintain standing water for a maximum of about ten days following rainfall. Soil type is Tuscan stony clay loam (Watson et al., Soil Survey Chico Area, U.S.D.A., 1929). *Sidalcea calycosa* is the most abundant plant in the depressions; associates include *Limnanthes floccosa* Howell subsp. *californica* Arroyo and *Eryngium vaseyi* Coult. & Rose var. *vallicola* Munz. *Erodium* spp. and *Bromus mollis* L. are common in the annual grassland between the low areas. The climate is Mediterranean with an average rainfall of 660 mm; precipitation in the 1984–85 wet season was 512 mm and for 1985–86 was about 835 mm. Average daily temperatures for January and July 1984 were 8°C and 28°C (Chico Univ. Farm, Climatological data, Chico, CA. 1984–86). Domestic live-

TABLE 1. MEAN NUMBER OF FRUITS PER PLANT OF *Sidalcea calycosa* IN BURNED AND UNBURNED AREAS AT THE END OF THE FIRST AND SECOND POST-FIRE SEASONS. Three plants in the southeastern corner of each quadrat were evaluated; 120 plants were used for each treatment in the first season; excluding quadrats infested by *Colletotricum malvarum* during the second season, n = 84 and n = 39 plants for burned and unburned areas, respectively; values are ± one standard error; ns = $p > 0.05$; s = $p < 0.001$.

Season	Burned areas	Unburned areas	p
First	5.4 ± 0.33	3.4 ± 0.19	s
Second	1.71 ± 0.17	1.21 ± 0.23	ns